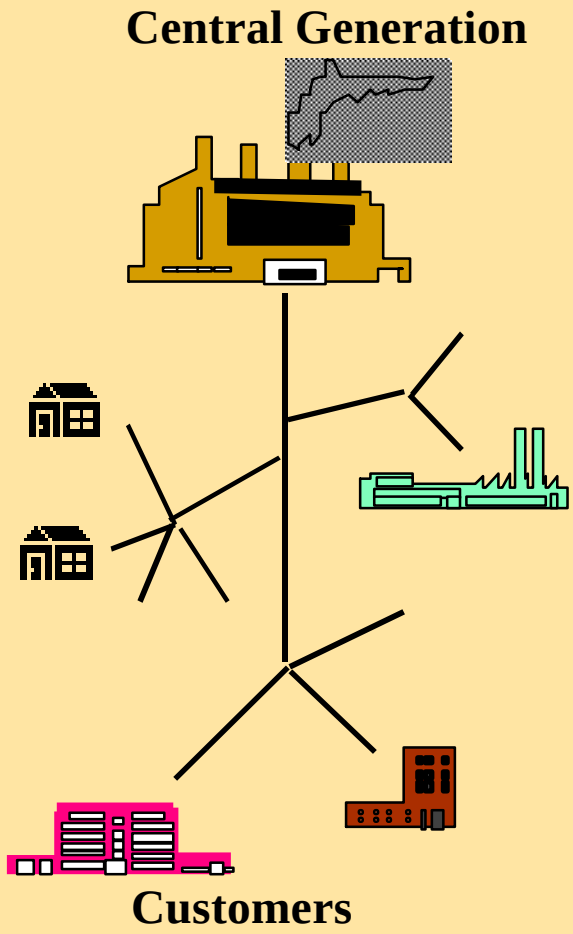
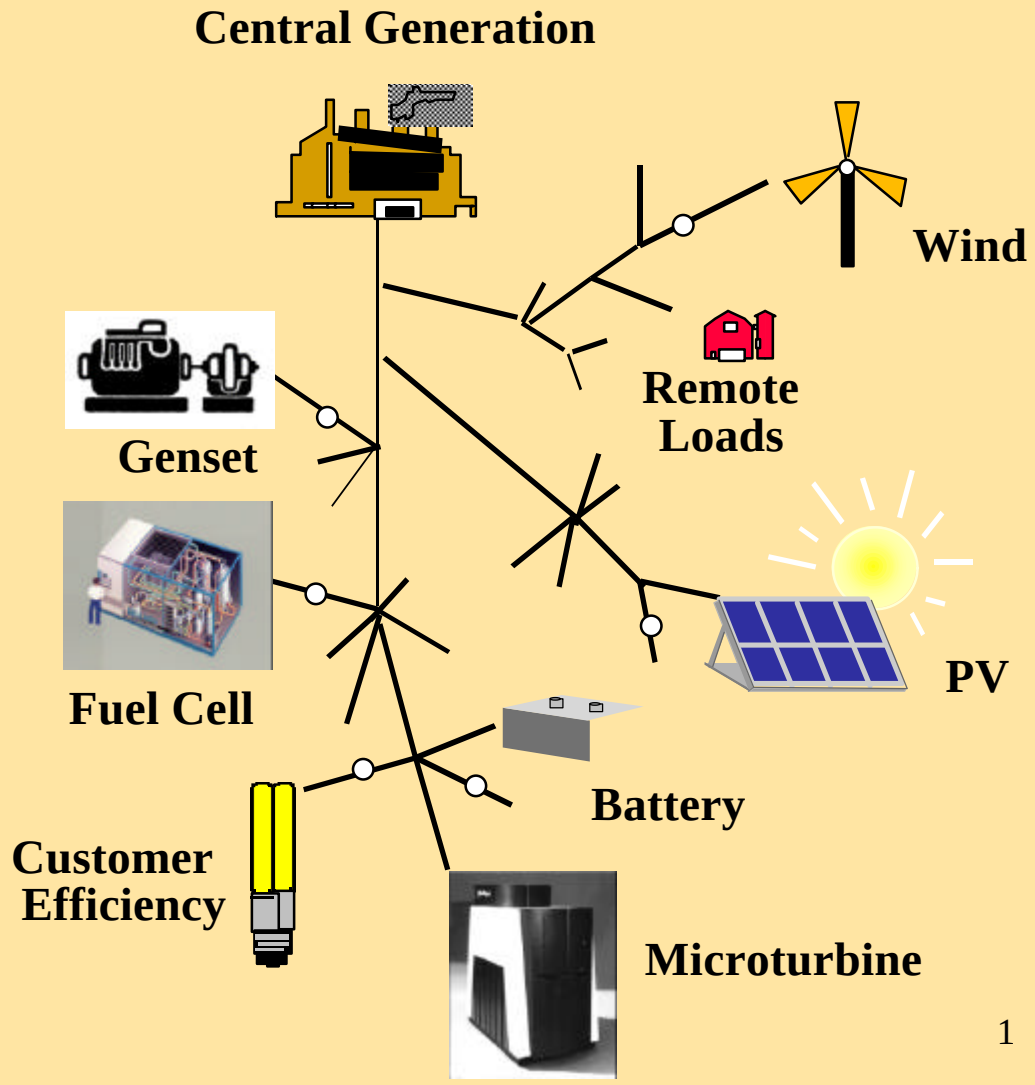
Today's Central Utility



Tomorrow's Distributed Utility?



Distributed Generation: What Is It?

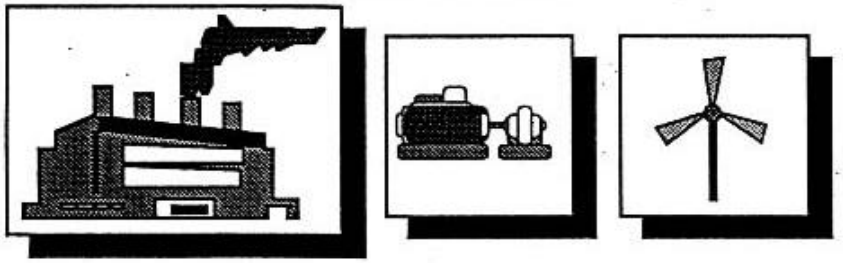
Distributed Resources (DR) are small (usually under 10 MW), modular electric generation and storage technologies that provide electric capacity and/or energy when and where needed. DR may either be interconnected with the electric grid or isolated from the grid in "stand-alone" applications, but its locational value is important to its economics and operation.

Distributed generation = DG
Distributed storage = DS

One View of the Future

1990s and Beyond

Generation



- Economies of mass production
- Smaller, clean generation units
- Fuel security, diversify generation portfolio

Customers

- Keeping competitive
- Buying services, not energy
- Good citizens: being green

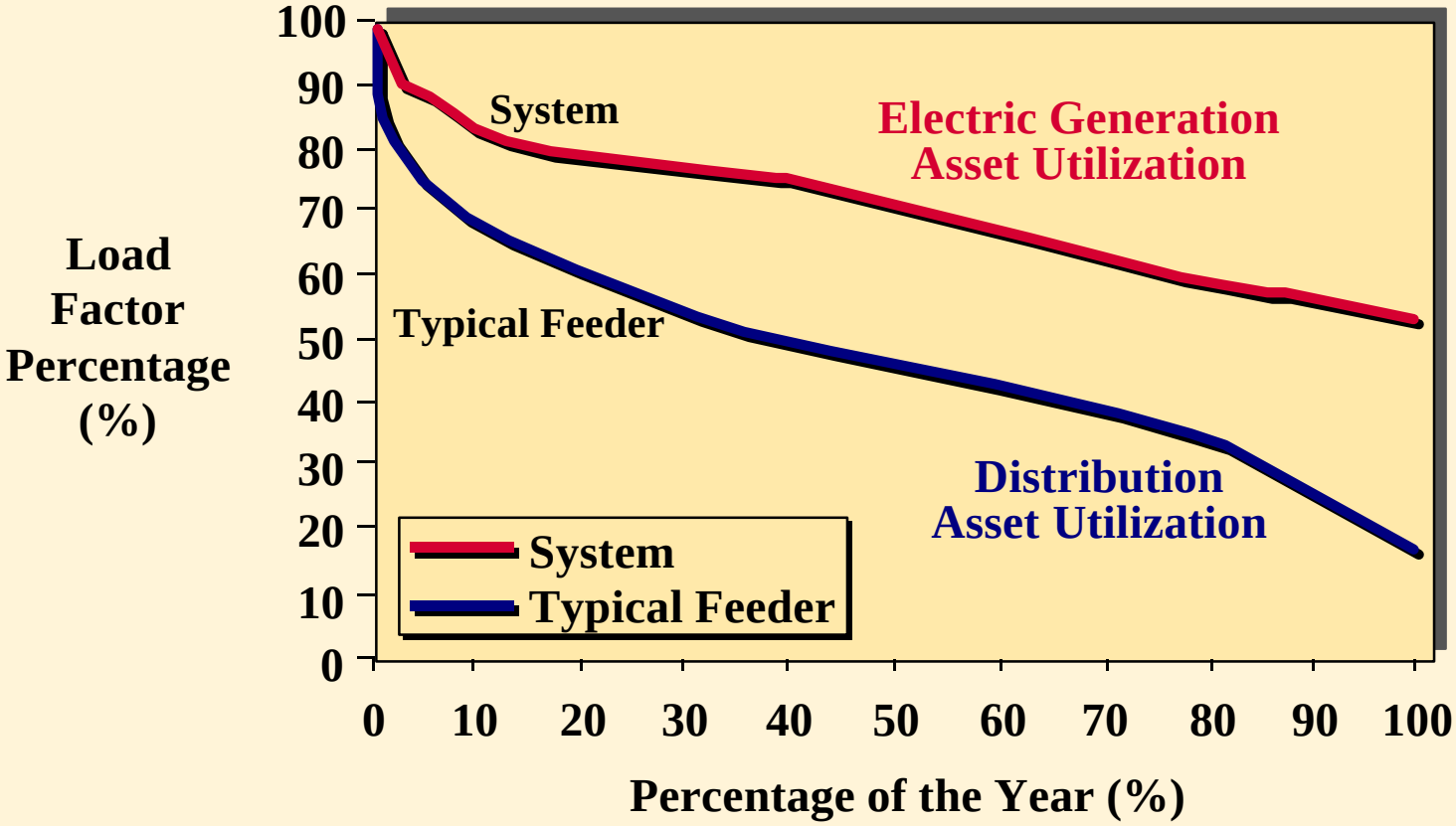
Strategy: manage and deliver energy services
Focus: provide valued services at least cost
Technology: exploit economies of mass production

Some Utility Benefits of Using DG

- Dispatchable peak demand reduction
- Maximum use of standby capacity through safe parallel operation with the utility grid
- Cost-effective solution consistent with least cost planning emphasis
- Improved system load factor
- Enhanced voltage stability and avoided line losses during heavy-load conditions
- Improved customer relations

The Distributed Utility Opportunity:
Improved Asset Utilization

Typical System Load and Percent of Feeder Maximum Load

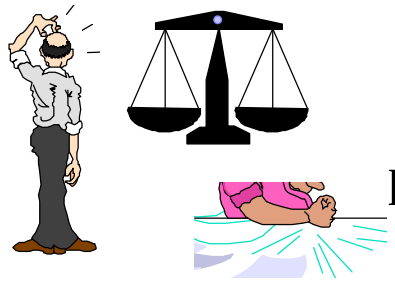


Customer Benefits of DG

- Bill reduction
- Reliability improvement
- Power Quality (PQ) improvement
- Customer partnerships

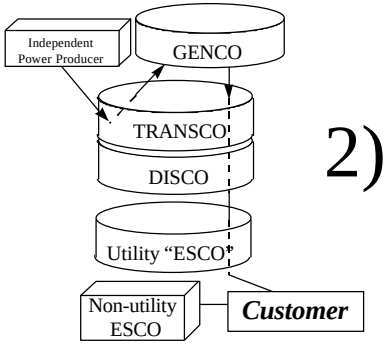
Forces Shaping Opportunities in the New Energy Marketplace

1) customer choice



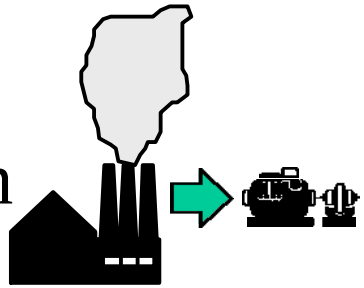
win-win

partnerships



2) utility restructuring

3) technology innovation



4) societal issues and trends

Customer Forces

- Restructuring and evolving regulation drive customers to be more proactive and informed about energy purchases and investments.
- Increasing need for differentiated energy services, e.g.
  - reliability
  - quality
  - cogeneration/thermal
  - “green” energy

Distributed Utility Opportunity

Enabling Value-Added Customer Energy Services, for example:

- DU technologies are key enablers/elements
- DSM, curtailable/interruptible rates, real-time pricing
- premium power (quality and/or reliability)
- back-up/temporary/off-grid power products and services
- renewable/“green” energy products and services
- cogeneration and thermal energy

Technology Forces

- Smaller, More Modular Generation
- Shifting Economies of Scale
  - equipment manufacturing versus central generation
- Improving Efficiencies of Smaller Technologies
- More Flexible “Optimizable” Solutions
- Many Improvements Driven by Significant Technology Push in Automotive Sector

Electric Utility Perspective

- Better Asset Utilization
- Improved Operation
- New Customer Products and Services

Customer Perspective

- Lower Energy Prices
- Better Service
- New Energy Products and Services

Gas Utility Perspective

- Increased Gas Sales
- Possible Demand Smoothing
- New Customers and Services

DU Technologies Characteristics

- ✓ mass produced
- ✓ modular
- ✓ clean
- ✓ natural gas
- ✓ cogeneration
- ✓ “small”
- ✓ efficient
- ✓ reliable
- ✓ renewables
- ✓ hybrids
- ✓ supportable by domestic industries

DG > 2¢/kWh

Ultimately it's Economics...
…but Whose?

Utility

Is DG the least expensive way to serve customers?

fuel + G + T + D

Cost of Service

Customer

Is DG the least expensive way to get electricity?

Bill Comparison

Tomorrow's DR "Markets"

- 90% Customers
- 10% Utilities

In the Best of All Worlds...

- Free market economics rule
- Environmental issues are included
- All parties cooperate for the common good

In This World...

- Utilities entrenched for 100+ years
- Customers bewildered, oblivious, and/or powerless

Yesterday's Rules Being Applied to:

- Today's technologies
- Formerly monopoly situations

Barriers

Technical - addressable with traditional technology-based RD&D

- DR technologies
- technical evaluation techniques & tools

Institutional - requires covering new, mostly non-technical ground

- business/management theories
- new regulatory structures
- new standards

Tomorrow's Power Market?

- More choices? Lower Costs? Eco-efficient & Sustainable Development?
- Full product range: *What Color is Your Electron?*
- Mass - Customization for All: McDonald's meets Thomas Edison
- DG will be a physical & financial hedge, due to:
  - enabling information technologies: neural networks, genetic algorithms, enterprise-level middleware for bulk optimization of supply and demand
  - "omni-directional" power flow, in response to spot/future power market signals

Summary Conclusions: Market

- Market studies indicate significant potential for Distributed Resources
- The Distributed Utility concept is becoming mainstream - developing the mindset is the next step
- The Distributed Utility concept is a viable way to meet many of the world's present and emerging energy needs, both urban and rural

On the Horizon: Utility Acceptance

- Distributed Utility concept is becoming mainstream - next step is to develop the mindset
- Need for more explicit regulatory “policy”
- Planning and evaluation tools are emerging
- Risk mitigation via small, redeployable infrastructure enhancements
- Under “performance based rates” distributed utility solutions yield superior financial returns in many situations, compared to traditional central generation/wires solutions

On the Horizon: Regulatory

- Who may own, for what?
- Who regulates?
- Interconnection standards?
- Emissions and siting standards?
- Standby charges?
- Exit fees?